**INTERNATIONAL AIRCRAFT FIRE TEST FORUM MEETING**

**Hosted by Hutchinson, Châlette sur Loing, France**

**June 6-7, 2018**

**WEDNESDAY, JUNE 6, 2018**

*Aircraft Materials Fire Test Handbook* Red Line Process/Update Discussion: Davis: are you going to have access to previous version if compliance was met to a previous version? Marker: yes, the archived Chapters are included on the FAA Fire Safety website.

Tim Marker gave a brief HR2 Review that covered work previously done by the Mike Burns (FAATC) and the Task Group.

Fuselage Fire Penetration Resistance Research at FAATC: potential fire protection weakness in the fuselage centerline (where insulation blankets from upper and lower fuselage meet) area is being studied.

Development of Magnesium Alloy Test – T. Marker (FAATC)

We are in process of initiating an interlab study (Round Robin) with three types of magnesium alloy: EL43, EL21, ZE41). Slaton: do you have a rough estimate on when Round Robin will take place? Marker: I had really hoped to have Round Robin completed and results back to me in two months from now. Luxfer will produce samples and FAATC will mill them to correct thickness for interlab study tests. Tim discussed the status of how magnesium alloy can be used and qualified today. Tim will developed detailed instructions on how to run the tests.

Cargo Airflow Test and Seat Test Update – T. Salter (FAATC)

Tim reviewed some of the information he presented during the March 2018 IAMFTF meeting: test cell layout was described, air velocity measurement device, 2 test lab scenarios (vent hood 1 and 2), shroud concepts 1-4 and test results of tests with each of these shroud concepts and without shroud. The Next Phase of the Airflow Study was discussed.

Sonic Burner Video Update: video production is taking a bit longer than originally expected. The script is currently being written, and Tim is working on scheduling the video lab to record and produce the video.

Planned Research and Work: continue cargo liner airflow study, design shroud for seat test, and sonic burner video, additional items from Task Groups. Campbell: you could consider for the oil burner maybe putting the shroud on a lever system independent of the sample holder. Salter: that's a good idea. One of our technicians mentioned that, too. Slaton: have you thought about getting a material that you get burnthrough on and test the shroud with that material? Salter: we have not gotten that far. We have not quite gotten that far with it yet. Magee: was the perforated shroud at 6 inches? Salter: it was 4 inches. We are going to work on making it easier so there's plenty of room for whatever types of clamps labs are using. Magee: if you ran the Round Robin would it just on the NexGen burner? Marker: I think you should open that up to any apparatus not just NexGen burner. Slaton: do some with shroud and some without the shroud. Salter: we are still working on a plan for the Round Robin. Question: are you going to look at the shroud in new condition and in used condition? Salter: the shroud we have used has gotten very sooted up. We

did not see any significant influence on any tests. Anglin: do you foresee this being an option in the Handbook? Salter: I'm not going to say anything on that yet. We need to see how the Round Robin goes and what labs think about it. Campbell: did you temperature and heat flux with the shroud? Salter: we did not do heat flux because it is not part of the sonic burner.

Burnthrough Round Robin Update – T. Salter (FAATC)

Tim Salter is the new POC for this testing. Rob Ochs, Ph.D. was previous project engineer for this work. Tim reviewed Phase 1 Round Robin results for 8579 and 8611 materials tests. The Summary of Phase 2 was reviewed. Tim is picking up with the next phase of this study. Plans for Phase 3: standardizing fuel nozzle type for burnthrough test, and conduct comparative testing at the FAATC, adjust burner settings to bring igniterless stator BT times closer to BT times obtained from original stator set-up. Tim explained the other differences for Phase 3 from Phase 2.

VFP Update – T. Emami (FAATC)

Tina gave the background of this work. Propane is recommended for future testing. Wire tests: The burn length is measured where the insulation is consumed and the wire is exposed (a photo of this was shown). Wire test results were presented. Videos of some of the tests conducted were shown. A photo of the wire after the test was shown. Tina discussed the planned work including a possible Round Robin possibly with composites. Rick Whedbee and Tina are currently deciding on the timeframe for the Round Robin. Schall: has butane been looked at? In Europe, butane is a little bit easier to get. Emami: there would have to be something to declare it equivalent to propane. We are focusing on propane. Anglin: some labs are not allowed to use propane due to restrictions from their municipalities, etc. Marker: we are asking labs that want to use other gases to show equivalence. Anglin: we cannot use propane from large tanks because of restrictions from our municipality, and the flow rate from the small tanks has a different flow rate. Schall: equivalency needs to be defined.

Radiant Panel Update – S. Rehn (FAATC)

*Aircraft Materials Fire Test Handbook* Radiant Panel updated in December 2017: removed air-propane panel; replace Kaowool M with Superwool 607; removed voltage requirement; added 5-minute average on heat flux measurement. Steve discussed some of these changes in more detail. +/- 5% Heat Flux Testing results were presented. Radiant Panel aging: some guidance must be added to Handbook about when to replace the panel. Radiant Paint Emissivity tests were conducted at FAATC. Steve described the tests and test results. He used FLIR camera to photo panel and showed this image. He explained calculating the emissivity. Radiant Panel Resistance was also studied. The results of these tests were presented. Resistance values of new panels vs. 5 older panels were plotted. Internal resistance of old planes was higher than new panels. Higher resistance should weaken panel. Future work: measure the emissivity of all of the panels, test all panels with a material sensitive enough to show small changes.

RTCA Update – S. Rehn (FAATC)

Steve provided the background for this project and the changes made to the draft test method. He reviewed the proposed drawings created by Alan Thompson. Pass/Fail Criteria: we had a lot of discussion during the last meeting on this. This is something we need to come to an agreement on. Steve discussed the future work: pass/fail criteria, discuss example drawings. Campbell: would you be looking also at where the box is being installed as one of your criteria (ex: if it is

being installed next to a number of metal boxes)? Rehn: no, we have not discussed that too much.

Flow Visualization in the OSU – T. Emami (FAATC)

Goal: create an adjustment to the current OSU apparatus in order to create an even air flow. This work is on the current OSU not the HR2. Tina discussed CFD with Hiquing Guo at the FAATC. He is unable to peform CFD at FAATC using current modeling program. A photo of the new test set up was shown and described. Tina discussed results of reticulated foam tests. She described a new idea with two plates and a trial with one plate.

Voltage Round Robin – Yaw Agyei (Boeing)

There were supply voltage fluctuations at production lab that affect heat flux density. Brian and Yonus (Boeing) discussed this with Mike Burns. Mike sent email to other labs with OSUs, and 22 labs are interested in participating. Group 1 of these labs will start their testing on June 11, 2018. A Questionnaire and Activity Log was created for each lab to complete during the 10 days.

HR2 TRL 5 Activity Update – Yaw Agyei (Boeing)

HR2 Development TRLs and Gates: TRLs 5-9 outlined and reviewed. TRL5: testing will be conducted in 2018 using 3 homogeneous coupon types: aluminum tape, undecorated standard laminate panel, and decorated standard laminate panel. TR5 Repeatability: testing in 3Q 2018. Wenderoth: first check to see that FAATC's two machines are talking to each other before going out to other labs.

Evacuation Slide Test – T. Marker (for D. Do – FAATC)

Tests were conducted to calibrate 2 heaters and to evaluate the Powerstat Variable Autotransformer. Photos of the two heaters were shown. Yellow/gray material, blue/grey material and mustard/mustard material results using 2 power control methods were presented.

Burner Cone Testing – T. Salter (FAATC)

Tim reviewed the background for this work. Defined cone specifications: alloy type, sheet metal gage (thickness), placement of bends, welds, and small features, tolerance for cone exit plane dimensions. Cone warpage study: cone exit plane may expand or contract out of tolerance, some labs experiencing excessive cone warpage and frequently repairing or replacing cones. Allow cone reinforcement? Cone Comparison Study: FAATC and outside lab. Tim described the cone comparison study. Results from cone comparison study were presented: low density foam results, medium density foam results. Outcome of study: the average percent weight loss and burn length differed between labs. The Handbook updates were reviewed. If you are going to use the reinforced cone, please use the design we've provided. This is the design we have tested. Spencer: was that solid bar or tube? Salter: solid. Spencer: do you think that would make a difference? Salter: I'm not sure how well hollow tube would hold up. Fimmel: tube doesn't work because it warps. The solid frame around the burner really prevents any warping. Salter: it is solid square bar. Question: how many times did you heat cycle that? Salter: FAATC heat cycled it 9 times, the other lab heat cycled it 9 times, so at least 18 times. Magee: do you have to have the frame exactly like you show it? Salter: that's fine, but we haven't tested any other design. Schall: is it welded all around? Slater: It is welded at the top, bottom and at the seams. Marker:

does anyone use the continuous flat ring that goes around the cone? Fimmel: we used to, but the welds break off. Question: what is the reason why the frame made the weight loss higher? Salter: good question. My guess is there's more mass to the cone, so it is radiating that heat off onto the sample.

Burner Flame Video: high speed video TCs in burner flame, demonstrates transient flame, thermocouples with high number of heat cycles do not respond to temperature as rapidly as new thermocouples. Reason why lower temperatures are seen when using worn thermocouples.

Additive Manufacturing Task Group – Thomas Krause (Airbus)

FSTG-like approach to Additive Manufacturing.
Identify key variables affecting fire safety requirements.
Simplify methodology of compliance demonstration to account for these key variables.
Final goal may be approved guidance material like the PS.
This Task Group's first meeting will be held Thursday, June 7, 2018.

Vertical Bunsen Burner Testing of 3-D Printed Material – S. Rehn (FAATC)

Ultem 9085 material was tested in vertical Bunsen burner test. We tested 1.5 mm material since that is the thinnest material. Steve reviewed the test results from the samples tested. Testing showed good repeatability when testing same orientation. Question: have you got any plans to carry out the tests on the VFP materials? Marker: yes, we will definitely do that. Kempers: how would these results on burn length and flame time compare to standard injection molded materials? Answer: the results are almost identical.

Material Change Similarity Task Group – Dan Slaton (Boeing)

Dan reviewed part of a presentation that Dr. Rich Lyon (FAATC) recently gave that relates to materials testing. He also reviewed the Regulatory Approach for this process. The MCC procedure was explained. MCC Task Group is using case studies to validate methodology. We are at a point where we get industry to push material changes through this process as part of the validation of this process.

Waste Compartment Fire Containment MOCs Task Group – Scott Campbell (Zodiac Aerospace)

Scott reviewed background for starting this Task Group. The group discussed Test Parameters: what about smoke? Smoke density is heavily impacted by the size of the waste compartment and size of the test chamber. Small receptacles if burned to completion would generate very little smoke. What about shimming? Shim size and placement not standardized. Shimming doors/flaps with metal trim that overlaps the door surround panels vs. nested door/flap designs that overlap internal metal door support trims. Hinge gaps will also be discussed. Purpose of this Task Group: Harmonize and publish industry and regulator accept 25.853(h) similarity requirements and MOCs for waste compartments and galley trolley carts. The Task Group will also talk about the properties of the materials we test.

THURSDAY, JUNE 7, 2018

Task Group Reports:

## Burnthrough Task Group Meeting Minutes June 2018

Prepared by Tim Salter, Task Group Lead (timothy.salter@faa.gov)

The ongoing interlab study, initiated by Dr. Robert Ochs, will continue with phase 3 which will involve the addition of a Delevan type fuel nozzle. Delevan nozzles have been used successfully in other burner test methods and have a more even fuel spray distribution compared to other fuel nozzles used in the past. Labs will be provided with test samples and Delavan fuel nozzles for phase 3. Phase 2 of the study included the use of the igniterless stator but testing showed an increase in burnthrough times for samples. Prior to phase 3 of the study, testing will be performed at the Technical Center to determine if the Delevan nozzle and any other burner adjustments can be made to bring burnthrough times back in line with phase 1 burnthrough times. Phase 1 used the conventional stator design (igniters and wires).

Davis: going to sonic has eliminated a lot of variability. The automotive fuel injector systems have gotten real inexpensive now, and I wonder if it might be worthwhile to try one of those to eliminate the last variable. Salter: that's a very good point. I'm glad you mentioned that. If you were to use a fuel injector as a nozzle, you could control that. That may also solve part of the chilling problem. Since the components are out there and relatively inexpensive, we will look into that. Thanks for the suggestion.

## Seat Task Group Meeting Minutes June 2018

Prepared by Tim Salter, Task Group Lead (timothy.salter@faa.gov)

The focus for the seat task group at this meeting was centered on use of a frame or reinforcement device attached to the burner cone. Heat cycling of the cone when the burner is used can often lead to distortion or warping of the cone. This leads to frequent repairs or replacement of the cone which can be costly and disrupts the testing process. A study conducted at the FAA Tech Center in the past had shown framed cones can change the airflow emitted from the burner, however, there was no testing performed to determine if this may effect test results. The FAA Tech Center and an outside test lab recently conducted a study using the seat test method to determine if they use of a frame cone may be permitted for certification testing. The results of the study showed that the use of the frame on the burner cone created a more conservative burn condition, or increased burning by a small amount on the test samples. The working group agreed the use of a framed cone should be allowed and will be added into the Fire Test Handbook for the seat test method. Use of the frame on the burner cone will be optional.

There was also discussion regarding and airflow study similar to the one performed recently using the cargo liner test method. Shrouding of test samples using the cargo test method has shown increased test result repeatability. A similar study will be performed using the seat test method to determine if a similar shrouding device or other means may also increase test result repeatability.

## Cargo Task Group Meeting Minutes June 2018

Prepared by Tim Salter, Task Group Lead (timothy.salter@faa.gov)

The cargo task group discussion focused on the perforated shroud design presented during the cargo liner airflow power point presentation. Task group members suggested alternate methods of mounting the shroud such that it would drop or swing into position to simplify sample mounting after each test. The current shroud design also interferes with the horizontal sample panel and

retaining frame. This will need to be considered when designing the next iteration of shroud. Task group members were asked if they would be willing to participate in round-robin where participating labs would be supplied with a perforated shroud and test samples. The labs would run tests with and without the shroud and return results to the FAA Tech Center for data result analysis. The round-robin inner lab study results may determine if the shroud design will perform as intended and reduce test result disparities among test labs.
The framed cone design will also be added into the Fire Test Handbook cargo liner test method. This would allow test labs the option to add a frame to the burner cone and reduce cone warpage.

Task Group Report for Magnesium Alloy Flammability Test
(from meeting held in Montargis, France June 6-7 2018)

Prepared by Tim Marker, Task Group Lead (tim.marker@faa.gov)

1. Discussion of Planned Interlab Study. The FAATC briefly discussed the proposed flammability test for magnesium components located in inaccessible areas. Over 280 radiant panel tests have been conducted to date using 0.025-inch thickness samples held in place using the truncated (shortened) perimeter-style sample holder. Results indicate the test methodology is repeatable, and a new draft procedure has been written up by the FAATC for future placement in the Fire Test Handbook (Chapter 26). Drawings of the latest sample holder are now available so that laboratories can fabricate them. In an effort to expedite the testing at various laboratories outside the FAA, several sample holders were constructed by the FAATC and sent to interested facilities. The FAATC has arranged an interlab study to determine test reproducibility when using identically-prepared materials. There are 5 interested laboratories that were sent a complimentary sample holder. Including the FAATC, this would be a total of 6 labs that can participate in the study. The FAA has initiated the procurement of magnesium alloy material and will begin the tedious process of milling the purchased samples down to the appropriate 0.025-inch thickness for the interlab study. Once the interlab study is completed, the results will be compiled and presented. Additionally, the draft test standard will be updated as necessary, and circulated to Task Group participants for review and comments. Boeing has also offered to review the test data to perform a statistical analysis, to provide feedback on the robustness of the test method and recommended pass/fail criteria.

2. Discussion of magnesium components used throughout the cabin. Over the past several years, the FAA has conducted numerous full-scale tests and laboratory-scale tests that have paved the way for the safe use of magnesium alloy inside the cabin. The initial effort targeted the 5 primary seat components (legs, spreaders, crosstubes, seat back frame, and baggage bar). Subsequent efforts have targeted smaller non-seat components used in inaccessible areas. Although special conditions must be granted for the use of magnesium in an aircraft seat, it is no longer banned as per SAE standard AS8049. Despite these milestones, there has been a lack of formal proposals submitted to the airworthiness authorities on magnesium alloy use in the cabin. Interest has shifted to smaller magnesium alloy component applications that could be used in both the accessible and inaccessible areas of the cabin. The problem is that most of the applications being discussed will not meet the surface-area-to-volume (SAV) ratio developed by the Task Group (the SAV ratio requirements were based on the magnesium components used in previous full-scale tests). The Task Group participants questioned if there were other options available for allowing these non-SAV-ratio-compliant components to be used in the cabin. The FAATC suggested that there are only 2 possible options moving forward: 1) perform additional full-scale tests similar to those conducted previously to evaluate the performance of these small components directly, or 2) Utilize one (or both) of the existing lab-scale flammability tests with some additional restrictions.

The FAATC indicated that conducting additional full-scale tests is costly, time-consuming, and not feasible at this stage. The Task Group members discussed possible additional restrictions that could be placed on the oil burner test and the radiant panel test.

One possibility would be to create a custom test sample for the oil burner test based on the mass of a standard test sample. The thickness of this custom sample would be based on the component that would be constructed of magnesium alloy. As a result, the overall height of the custom sample would increase. To illustrate this, consider the following example:

Solid Tray Table Arm for flip-up tray
SAV ratio: 30 (exceeds accepted criteria of 20)
Minimum thickness of tray arm: 0.100 inches
Material: XX-99 alloy

Step 1. Ensure that material XX-99 alloy meets the oil burner test in the standard sample configuration (i.e., no ignition prior to 2 minutes, maximum weigh loss less than 10%)

Step 2. Measure weight of standard test sample using this alloy (Material XX-99). For this example, assume the standard sample has a weight of 0.500 lbs.

Step 3. Calculate density (weight/volume) of Material XX-99. For this example:
$D = 0.500 \text{ lbs} / (0.25 \times 1.5 \times 20) = .06667 \text{ lb/in}^3$

Step 4. Fabricate a custom sample of Material XX-99 that weighs 0.500 lbs, has a length of 20 inches, and a thickness of 0.100 inches (solve for h).

$D = m / (l \times w h)$ ,
$D (l \times w \times h) = m$ ,
$l \times w \times h = m/D$
$h = m / (l \times w \times D) = 0.500 / (20 \times 0.100 \times .0666667) = 3.75$ inches

Based on the above, a custom sample measuring 0.100 inches thick, by 3.75 inches high, by 20 inches long would be fabricated and tested. The FAATC has agreed to experiment with this approach, to determine the feasibility. The FAA/EASA agreed to continue their internal dialogue on how this approach or a similar approach could be incorporated to justify applications for magnesium use that are not within the present guidelines developed by the Task Group.

## Radiant Panel Task Group

Prepared by Steve Rehn, Task Group Lead (steven.rehn@faa.gov)

In the Radiant Panel task group, we first talked about the reduction of the tolerance on the heat flux calibration from ±5% to ±1%. We discussed whether ±5% was enough to cause a difference in test results and based on our testing data we agreed that it can. We also discussed the transient variation on the heat flux measurement during calibration. There is always some noise in the heat flux signal and the temperature controller on the electric panel always varies slightly from the set temperature. There will always be some variation up and down on the instantaneous heat flux measurement. Reducing the tolerance on the calibration will not solve this problem but it should help the value stay more centered on the calibration value.

Another problem that was brought up was that the heat flux gauge itself is not accurate to within 1%. However it would compound the problem even further if the set heat flux value and gauge error are both greater than 1%. We generally agreed that it should not be too difficult to get within 1% of the heat flux calibration value and that most labs already do that, but we plan to have everyone check with their lab and make sure it is obtainable for everybody.

We also talked about the radiant panel aging study that we have in progress. The testing is going well but the main thing we still need is material to test that will show a difference between an old panel and a new one. Two people volunteered to send material, so hopefully at least one of them will be sensitive enough to show a difference between old and new panels. We talked about the general approach to this study which is to collect as much data as possible to try to determine the cause of degradation in older panels. On all of our electric panels, we will measure the surface emissivity, internal resistance of the emitter strips, three-position calibration, panel set point, and material test results. A few new ideas were brought up as well. One was to measure the transient variation in the instantaneous heat flux measurement and determine if there is more variation in older panels than new ones. We could also measure the input power going to the panel. Lastly we could measure the recovery time on the panel of how long it takes to reach its temperature set point after opening the drawer for a set period of time during calibration. The goal is that with all of these data points we will be able to determine a good way to know when to replace an aging panel which will help the repeatability of testing across all labs.

## RTCA Task Group

Prepared by Steve Rehn, Task Group Lead (steven.rehn@faa.gov)

In the RTCA task group meeting, we first talked about the testing done on airflow limits of electronic boxes. We discussed the approach of setting a minimum amount of ventilation needed for a test to move forwards and agreed that it is a useful idea. If a box has less ventilation than is required to sustain a given fuel flow rate, then it will not need to be tested. We discussed if we know for sure if we have found the absolute minimum airflow required to sustain a flame and thought of a couple more testing ideas to try. We could try one large hole on top and bottom the size of the entire open area and see if that is able to sustain a flame more easily. Another possible test could be done with a shorter box because the two box sizes tested so far were about the same height.

We also discussed the pass/fail criteria. We previously defined it as no flame more severe than the 12 second Bunsen Burner should be allowed to escape, but that would be difficult to measure the height of the flame escaping and the amount of time it is outside the box. But if we could run testing to prove that a large flame escaping for a short amount of time, such as a capacitor exploding, doesn't have enough energy to ignite a material above a box, then we may be able to simplify the pass/fail criteria to just timing the flame escaping which would be much simpler. If that does not work out, then we will probably need to have a similar pass/fail criteria to the telecom industry test on which our test is based. They use a rack of material similar to circuit board material placed above the box being tested and if that ignites it is a failure.

And lastly we talked about comparative testing that needs to be accomplished. As a start, the three of us with line burners will all build a 4MCU aluminum box of the same size and air hole pattern and have the same material and arrangement placed inside. We will each test our box using our draft test method and see if we all conduct the test the same way and get the same results.

## VFP Task Group Summary

Prepared by Tina Emami, Task Group Lead (tina.emami@faa.gov)
June 6-7, 2018

1) Test with 3 wires and compare effects to 5 wires. 3 Wires is preferred by the group.
   a) Suggested to bring the wires closer to simulate a bundle
   b) Maybe look into Kaowool vs no Kaowool backboard
   c) We could potentially standardize a wire gauge for testing. Can choose between 20-16 gauge wires
2) Methane vs. Propane: Study more to understand equivalence
3) Calibration of mass flow? Still to come: calibration of machine in general
4) Samples were offered to test with the same material flat sheet vs. round duct
5) Sleeving
   a) Pat(FAATC) tested with the copper tube in the radiant panel in the past, will look into the details of these tests
   b) Final comparison to consider: Testing the sleeving over a copper tube or ceramic tube
6) Airflow through VFP
   a) Some are having issues mimicking airflow. It has been reported that the ribbon burner has a stronger flame and ignites and burns the samples quicker than previous burner. This is alright because we have not set a pass/fail requirement yet. There were 2-3x longer burn lengths because of the severity of the new flame. Still looking to find a flame time that is comparable to the foam block test.
   b) May need to require clearance of obstruction around the lab to make the airflow more uniform between labs. How close is the VFP to the wall? How close is it to a hood?
   c) The idea of potentially putting in baffles of an exhaust lid was brought up
7) Generic drawings need to be updated for everyone to review, with link.
8) The parameters of the test also need to be updated and uploaded onto the website. Specify power supplies to the whole group and power controllers.
9) Round Robin
   a) It was agreed that 30 samples need to be tested per material per lab for statistical purposes

## PIV OSU SUMMARY

Prepared by Tina Emami, Task Group Lead (tina.emami@faa.gov)

June 6-7, 2018

1. The group agreed they would like the air inlet through the side of the OSU versus the bottom
2. Consider baffles around the inlet to disperse the air from there, or something in any location to disperse the air evenly out of the 120 hole plate. I will also look towards trying to measure the speeds leaving the holes of the plate with the PIV.
3. Making use of an aluminum honeycomb was also discussed.
4. To distribute the air through the OSU better an idea was given to put a tube throughout the length of the OSU with holes to evenly distribute the air throughout instead of rocketing it in. This needs to be planned around the thermopile as well.
5. It was agreed that measuring the airflow near the sample is preferred over the chimney exit.

6. To create a baseline measurement, it was suggested to measure the airflow without the sample placed in the OSU.

## Fire Containment Task Group

Prepared by Scott Campbell, Task Group Lead (scott.campbell@zodiacaerospace.com)

Group discussed design criteria, methods of compliance and Test criteria. Handout went out to all attending participants and will be emailed to task group members with more detailed minutes. Specific interest included:

1/ Fire Containment Smoke requirement- only listed in the Fire test handbook (not in the rule or AC25-17A). EASA does not require smoke compliance and some OEMs don't reference the fire test handbook and don't monitor smoke. Agreed it's very subjective dependent upon the volume of the compartment and volume of the test cell. All agreed that smoke would be detected by crew, passengers, detection systems before it could inhibit fire fighting activities. Will explore compartment volumes that could also be exempt (if smoke is kept) and research incident data for any instances of large quantities of smoke inhibiting fire fighting activities.

2/ Shimming- many different shim dimensions are being used. Look to standardize on length, width and location for various design types.

3/ Group agreed that exterior decorative materials do not impact test results.

4/ Discussed 50% flame front and thermocouple readings

5/ Interest in simplifying hinge gap analysis for comparing units.

6/ Discussed trash 'conditioning'. Most condition in an office/lab environment. Few condition at 50% RH 79 F. Also discussed potential guidance for crumpling trash for test.

7/ Discussed the 45-degree Bunsen burner test for pass through features such as hoses, plastic waste containers and exposed door seals.

In all discussed about 30 MOCs and required design criteria and 9 test phase aspects. Few assignments were agreed upon and a desire to meet via WEBEX 1-2X before the next meeting. Please contact Scott Campbell if anyone wants our handout and / or wish to meet with us in our WEBEXs.

## Voltage Round Robin

Prepared by Yaw Agyei, Boeing (yaw.s.agyei@boeing.com)

- Voltage recorder distribution commencing on week of June 11th
- Expecting about 70% of round robin data to be shared at October meeting
- Group 1
    - Jamco – America, General Plastics, Zodiac Heath Tecna, Krueger Testing and Consulting, Element Materials Technology
    - Recording begins June 18th and ends June 28th

- Group 2
  - HAECO Americas Cabin Solutions, Accufleet Testing Services, Skandia, SEKISUI SPI, Schneller
  - Recording beings July 19th and ends July 31st

## Heat Release Rate 2 Development

Prepared by Yaw Agyei, Boeing (yaw.s.agyei@boeing.com)

- TRL 5 Activity
  - Phase 1 – OSU comparative testing at Boeing. Seeking to complete testing by late July.
  - Phase 2 – testing at FAA Tech Center – Boeing (Brian Johnson, Yaw Agyei) to support. Test schedule to be determined.
- TRL 6 Activity
  - Seeking units for reproducibility assessment. Currently one unit online at the FAA tech center (Marlin Engineering). Deatak unit requires software updates.
- TRL 7 Activity
  - Testing of range of materials. Seeking variety of materials to test at this level
    - Boltaron, Sabic, Tencate – volunteered to provide materials
    - Kydex, Solvay – may also be able to provide samples (unique materials)
- TRL Levels Gate Criteria
  - Boeing to propose TRL gate criteria to facilitate discussions at the next meeting.

## MCC Task Group (Material Change Similarity)

Dan Slaton, Task Group Co-Lead, (Daniel.b.slaton@boeing.com)

Dan Slaton shared an update of the presentation that Dr. Rich Lyon presented at the BCC Research Flame Retardancy of Polymeric Materials conference in May. The MCC approach and methodology was reviewed. During the Task Group session, Dr. Patrick Zimmerman of 3M and Pom Sattayatam from Zodiac shared their experiences and future plans to utilize MCC. Zodiac and Boeing are evaluating phenolic materials using the MCC methodology as case studies to compare MCC results and OSU results. An update to the current draft guidance (posted on the FAA website in 2016: https://www.fire.tc.faa.gov/pdf/materials/MCC_Guidance_June_2016.pdf) will be posted later this summer along with a test plan/report template to use for material change case studies. Industry is encouraged to evaluate material changes using the MCC to help validate this guidance.

## Additive Manufacturing Task Group

Prepared by Thomas Krause, Airbus (Thomas.krause@airbus.com)

Participants: 26

The group's discussion was characterised by two things: Working on a comprehensive list of variables potentially influencing the flammability behaviour of parts produced using the Additive Manufacturing process, and the industry's current use of this technology.

It was agreed that guidance material for fire safety certification will ultimately be needed given the technology's rapid development and increase in complexity. Simplified methods of compliance demonstration in the guidance material will have to be backed up by data provided by the participants. It also requires a selection of the key variables influencing fire test results based on both the acquired data and engineering judgement. The list of variables in the Additive Manufacturing process shown in the presentation session will be distributed to the group and participants are asked to complement it. Some sort of ranking for the anticipated/expected severity of these variables in respect to the various fire tests can then be worked out by the group.

In parallel, the group will try to gather existing data to build a model case with an already used technology (Fused Deposition Modelling) and material (ULTEM 9085 Model). It was understood that this will be not sufficient to explore critical (= potentially driving performance close to certification limits) variables from the list given the large safety margin for this material evident from the first results presented by the FAA Tech Center. The transferability of results from conventional production technologies to the certification of Additive Manufacturing parts is another stream that the group will explore (cf. Material Change Similarity Task Group).

A conference call will be scheduled in the coming weeks to decide on the next steps.

Next Meeting:

October 29-30, 2018
(meeting to start afternoon of October 29th, run all day on October 30th)
Resorts Hotel-Casino
Atlantic City, New Jersey, USA

Please note: The International Aircraft Systems Fire Protection Forum will meet October 31-November 2, 2018, at the same venue.

Information/Meeting Details for both meetings will be available at www.fire.tc.faa.gov in the coming months.